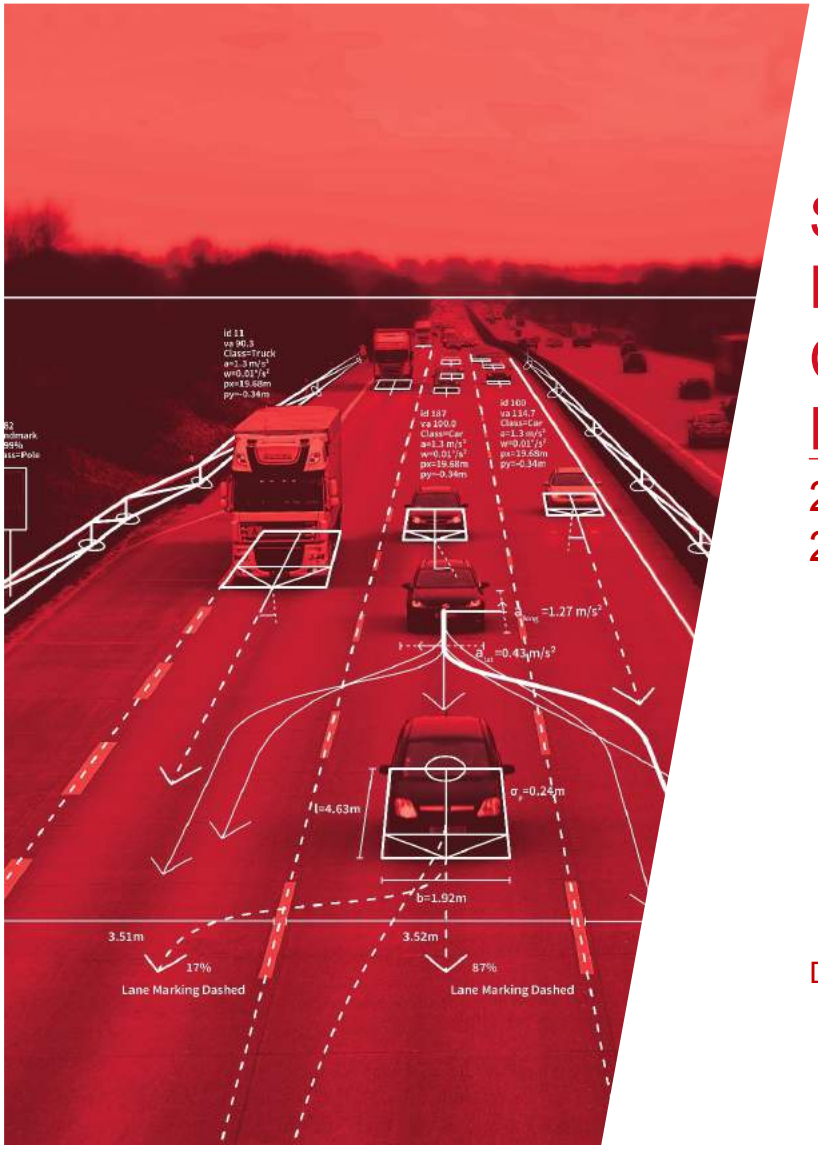


SOLID STATE LIDAR TECHNOLOGY: A RESPONSE TO CURRENT CHALLENGES IN AUTONOMOUS DRIVING

2nd DVN Conference Automotive LiDAR/Frankfurt/Dec 3, 2019

Document Category: Public

INTRODUCTION TO IBEO AUTOMOTIVE

Foundation of ibeo Automobile Sensor GmbH in 1998

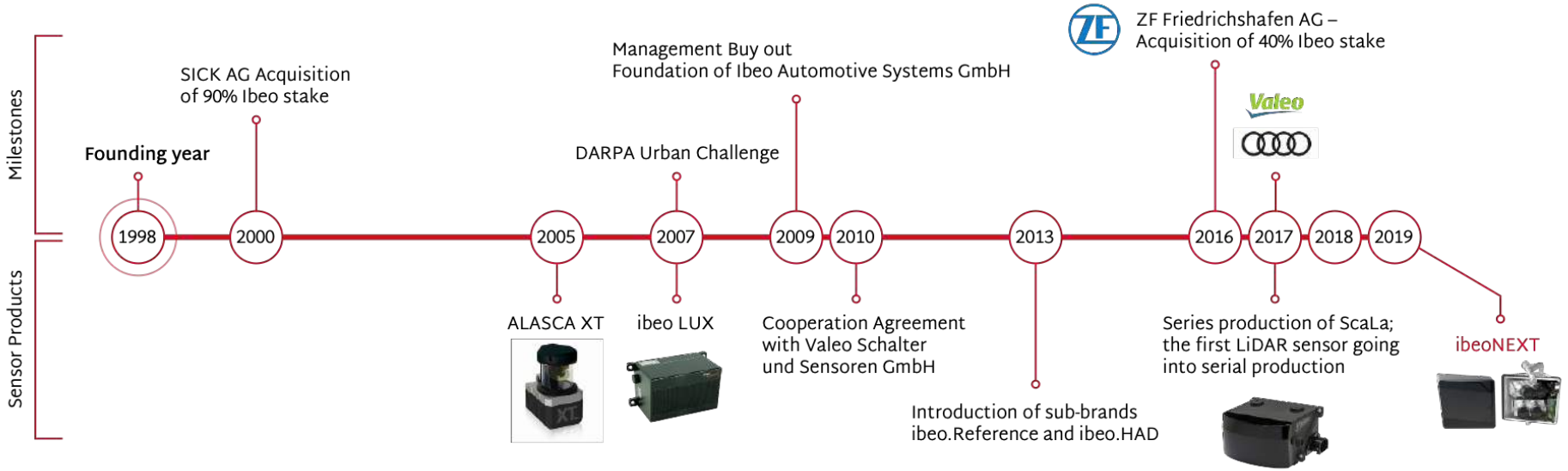
Headquarters based in Hamburg, Germany
Offices in Eindhoven, Netherlands
Coming soon: USA and China

Worldwide technology leader in the field of LiDAR sensors, associated products and software tools

350+ employees in 2019
Amongst Hamburg's best employers 2019

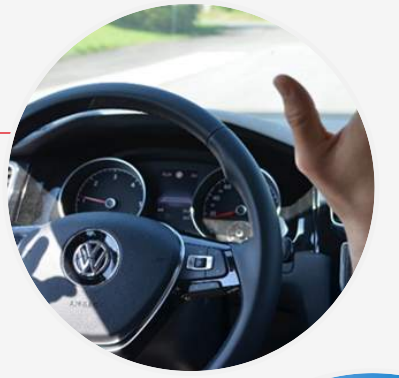
Sales increase from 2014 to 2018 – 342%

A 20 YEARS SUCCESS STORY



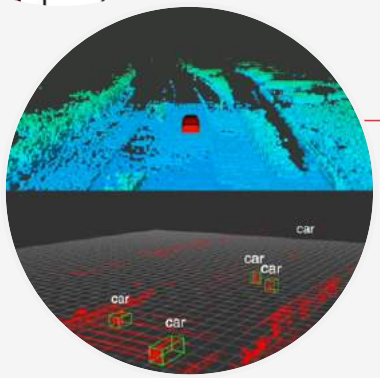
IBEO'S AREAS OF EXPERTISE

Autonomous Driving (AD)



Reference

Off-Road Applications



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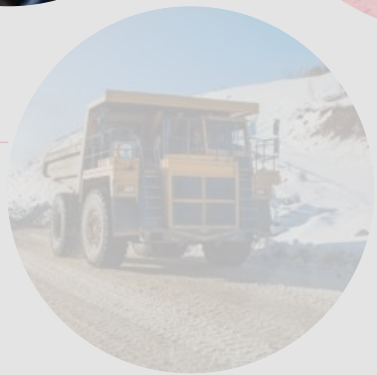

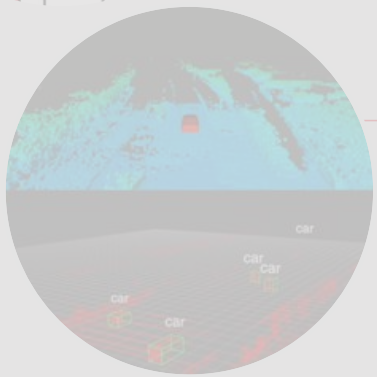

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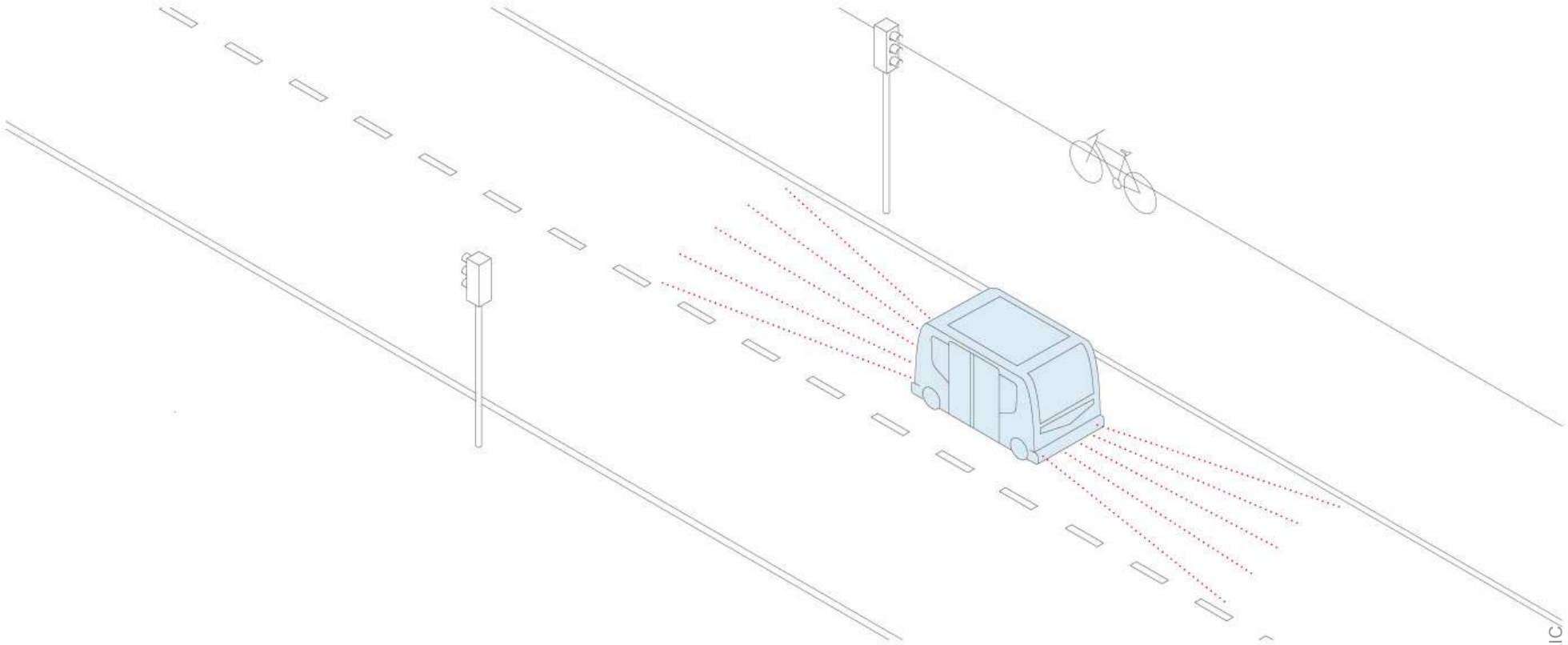
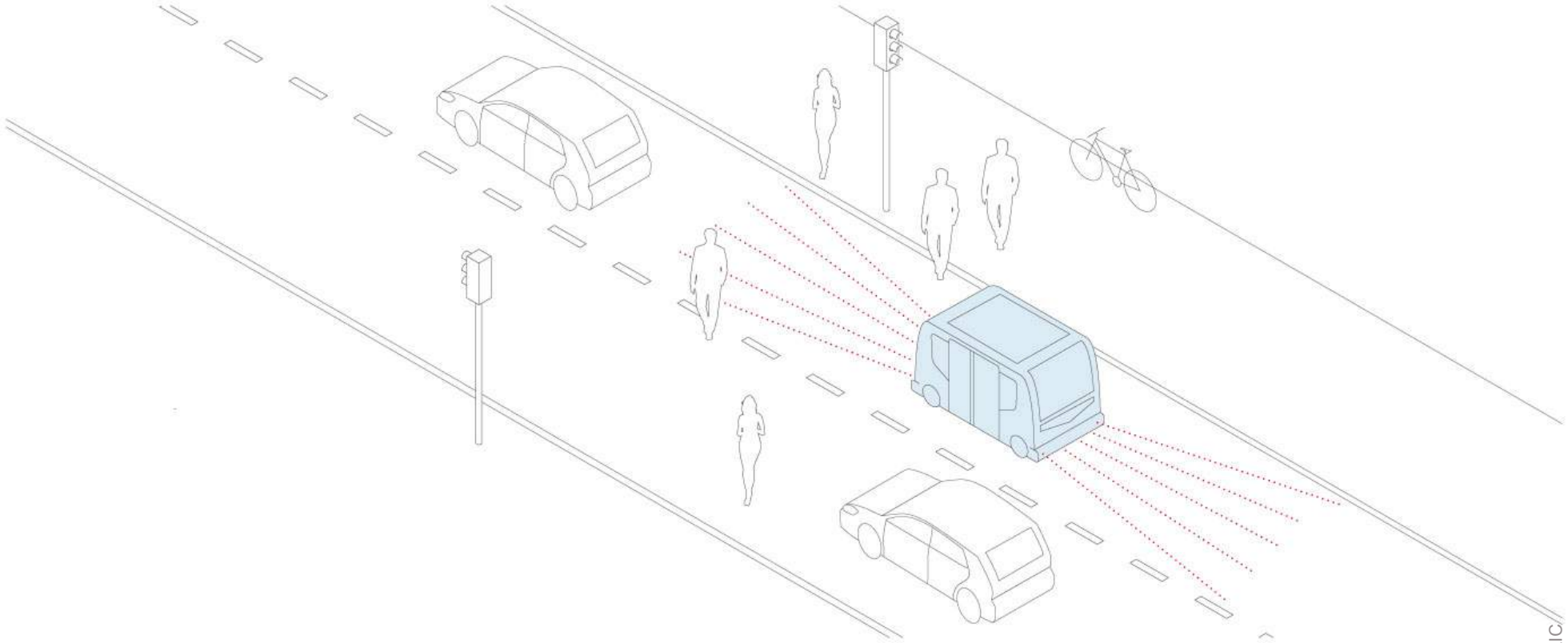
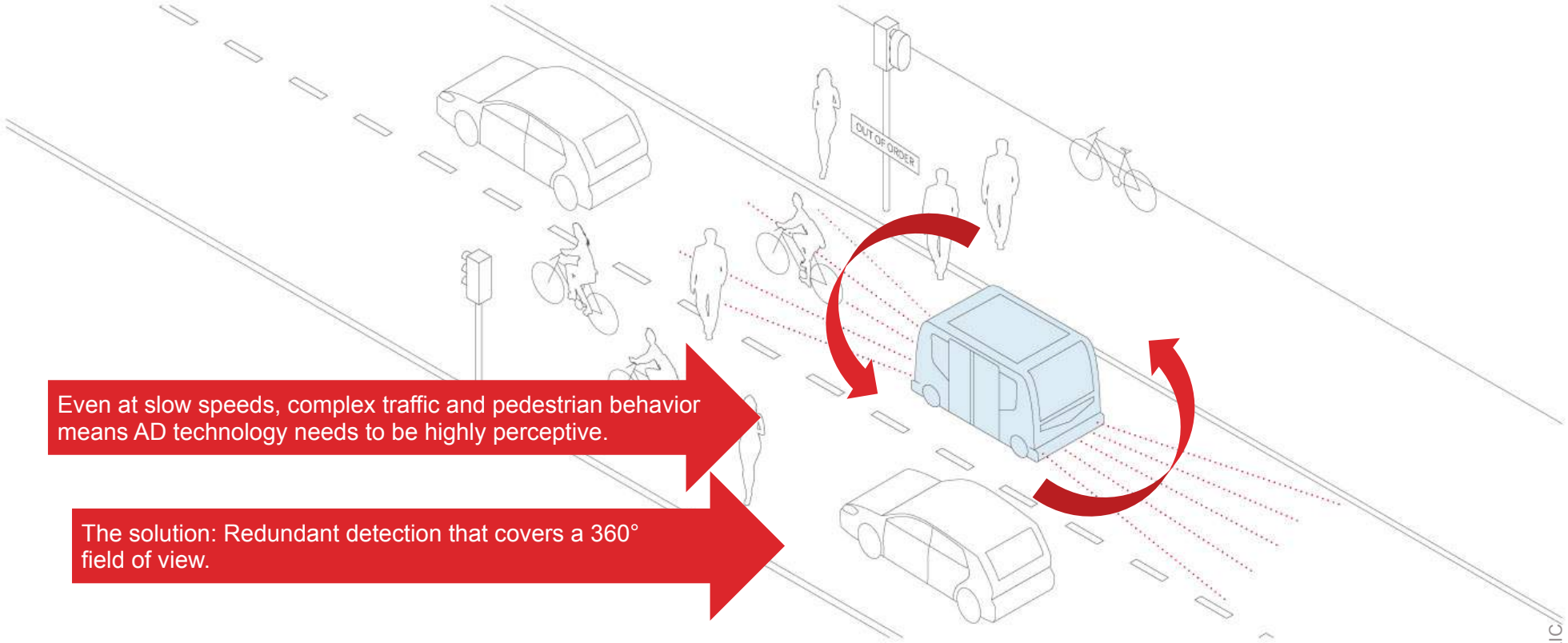
CHALLENGE 1:
AN AUTONOMOUS PASSENGER TRANSPORT FINDS NAVIGATING MORE DIFFICULT THAN WOULD BE EXPECTED



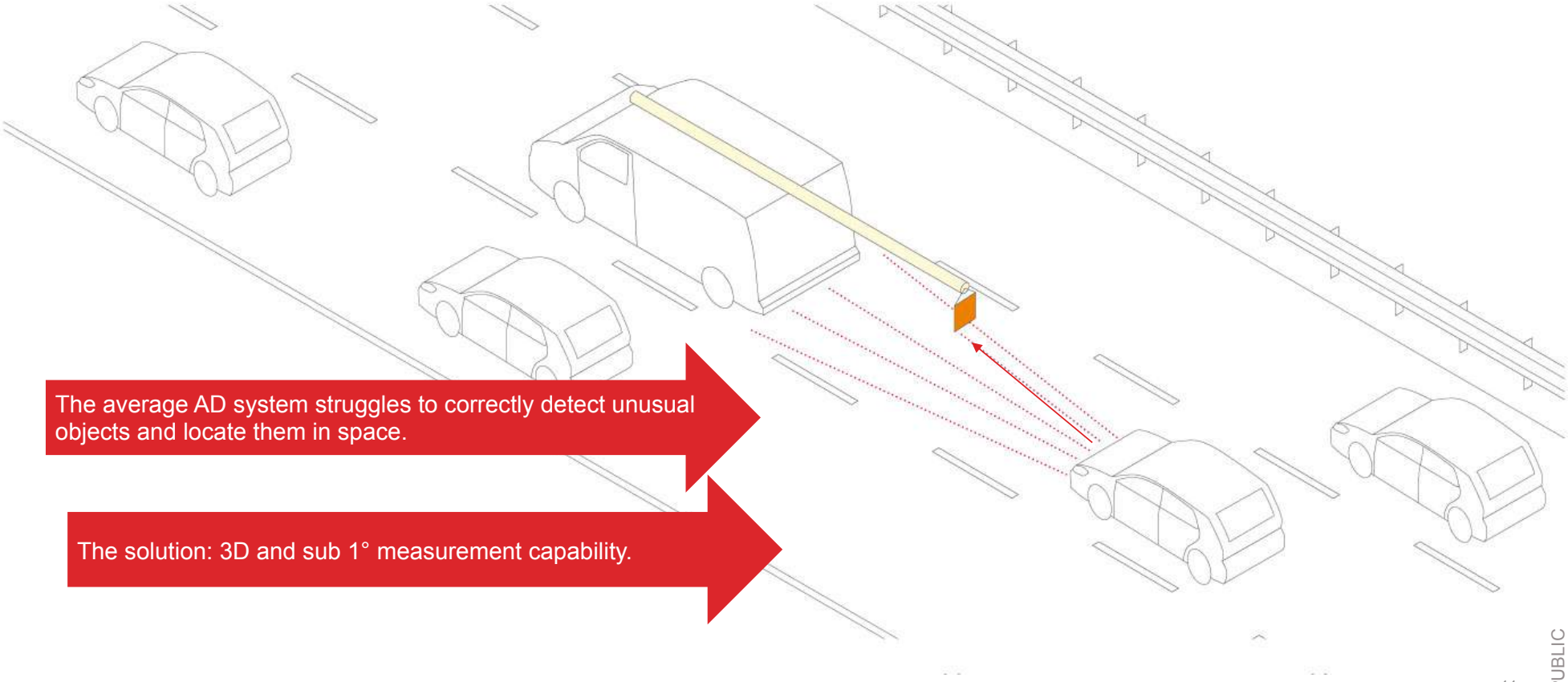




Even at slow speeds, complex traffic and pedestrian behavior means AD technology needs to be highly perceptive.

The solution: Redundant detection that covers a 360° field of view.

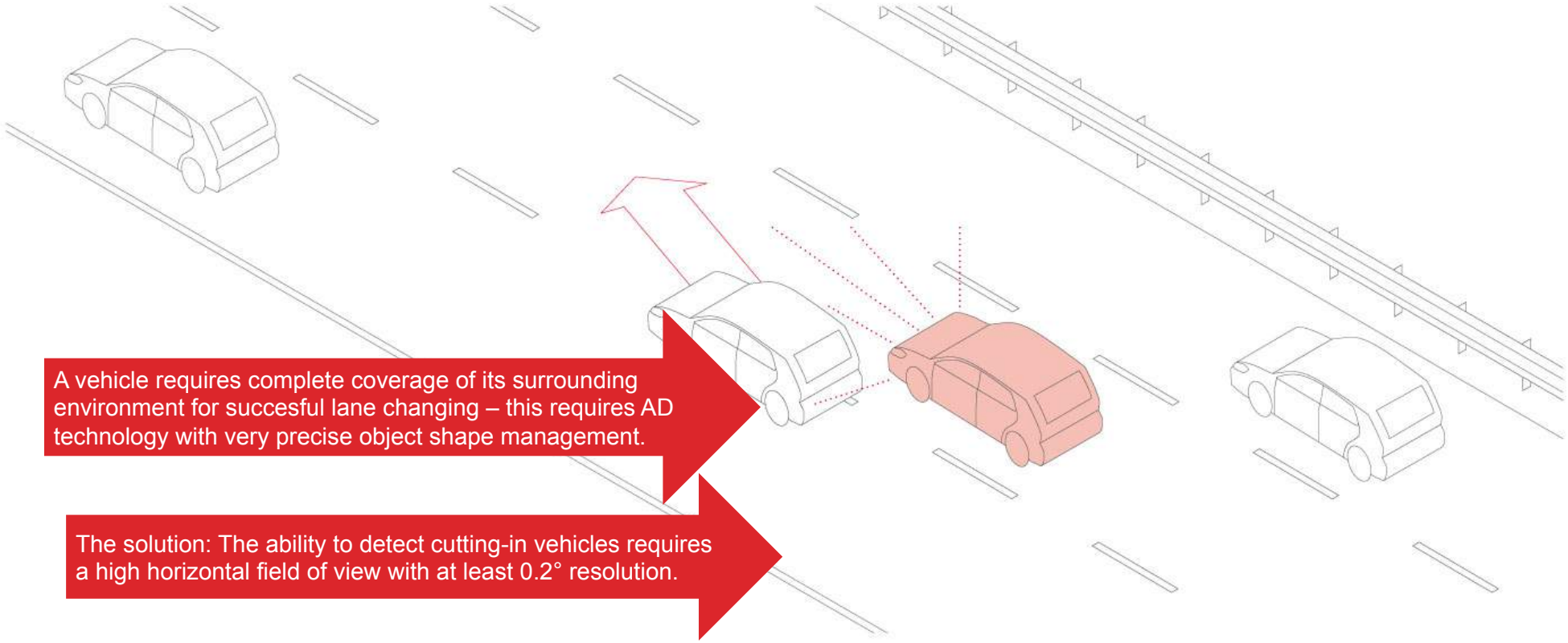
CHALLENGE 2:
TRUCKS WITH OVERHANGING LOAD ON HIGHWAY



The average AD system struggles to correctly detect unusual objects and locate them in space.

The solution: 3D and sub 1° measurement capability.

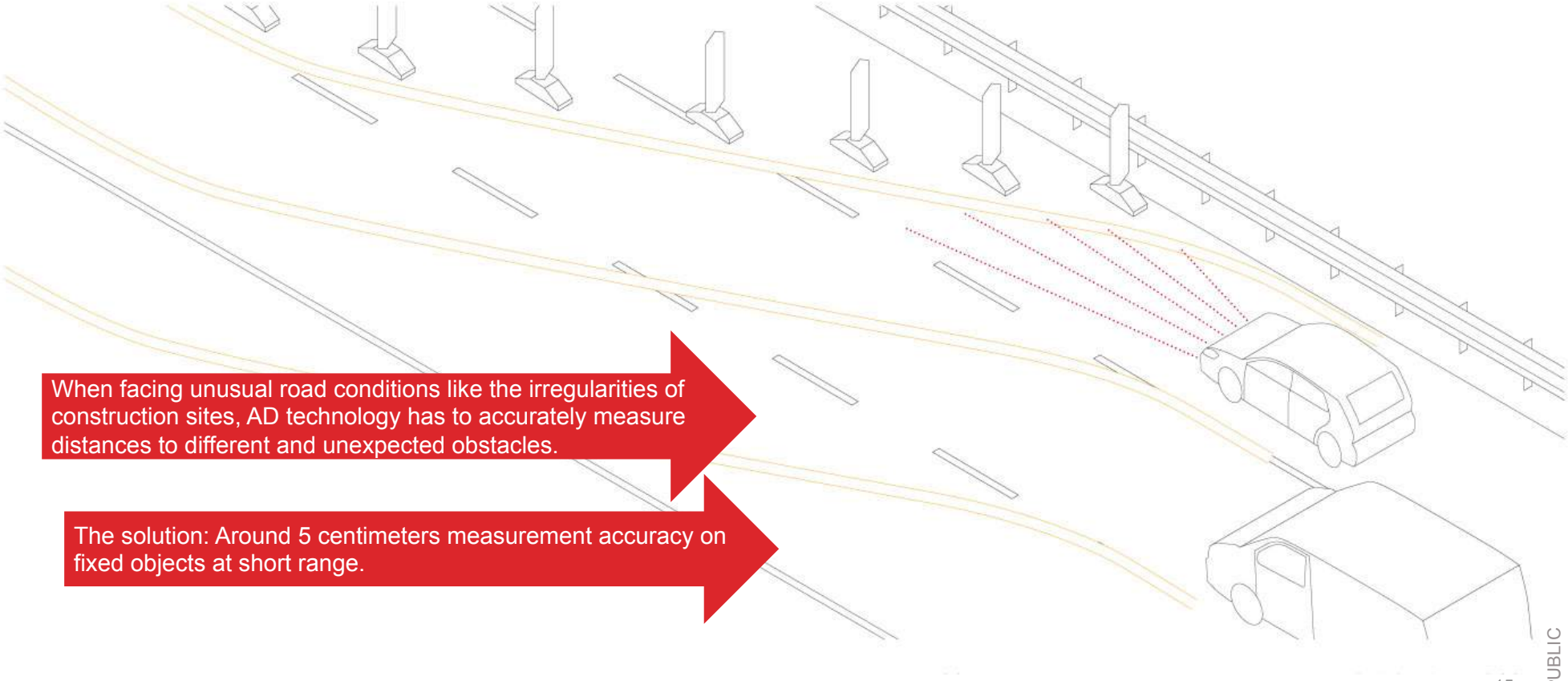
CHALLENGE 3:
LANE CHANGE MANEUVERS ON A HIGHWAY



A vehicle requires complete coverage of its surrounding environment for succesful lane changing – this requires AD technology with very precise object shape management.

The solution: The ability to detect cutting-in vehicles requires a high horizontal field of view with at least 0.2° resolution.

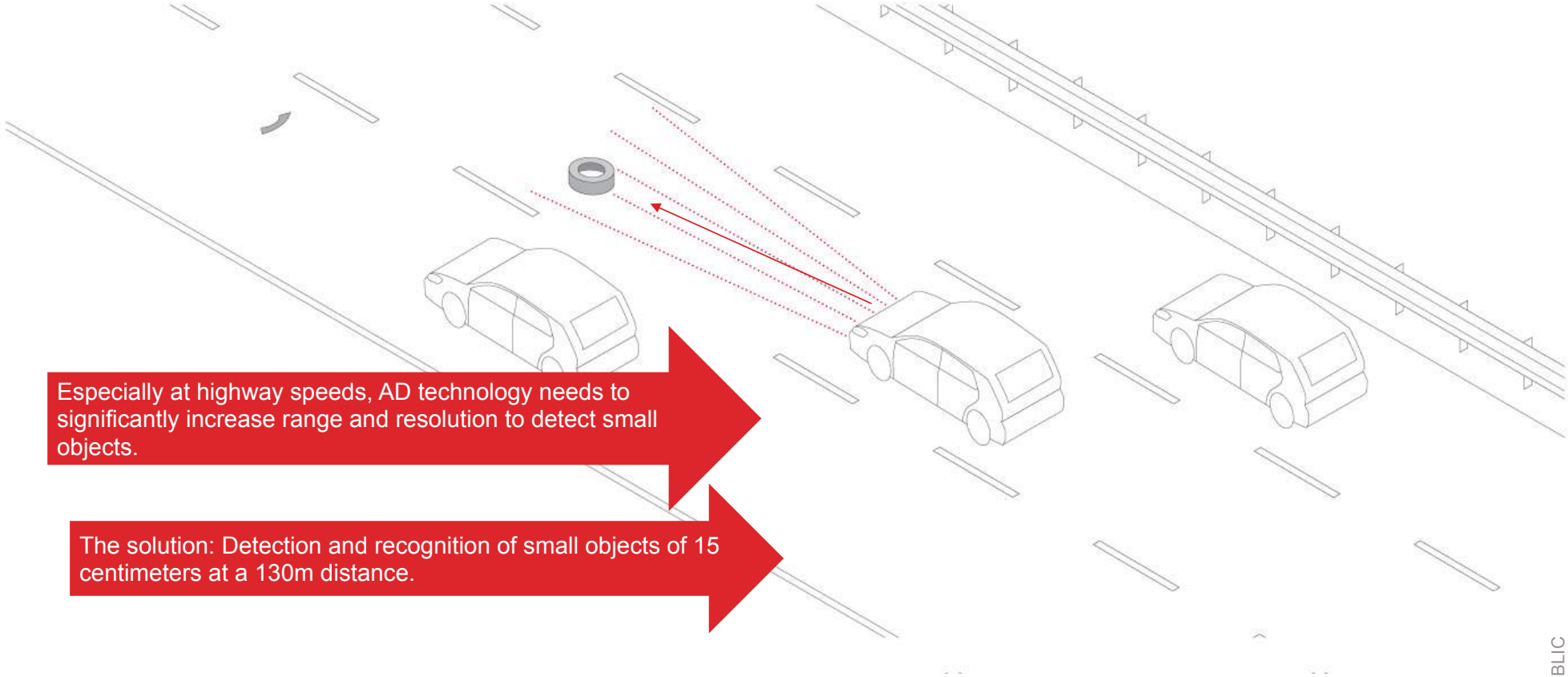
CHALLENGE 4:
A CONSTRUCTION SITE ON THE HIGHWAY IS A TRICKY SCENARIO



When facing unusual road conditions like the irregularities of construction sites, AD technology has to accurately measure distances to different and unexpected obstacles.

The solution: Around 5 centimeters measurement accuracy on fixed objects at short range.

CHALLENGE 5:
DETECTING A SMALL OBJECT ON THE HIGHWAY



Especially at highway speeds, AD technology needs to significantly increase range and resolution to detect small objects.

The solution: Detection and recognition of small objects of 15 centimeters at a 130m distance.

HOW CAN WE ADRESS THESE AUTONOMOUS DRIVING CHALLENGES, AND MANY MORE?

IBEO'S AREAS OF EXPERTISE

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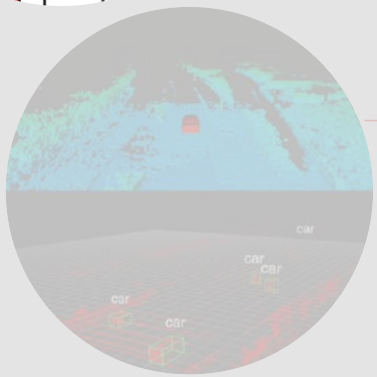
Off Road Applications



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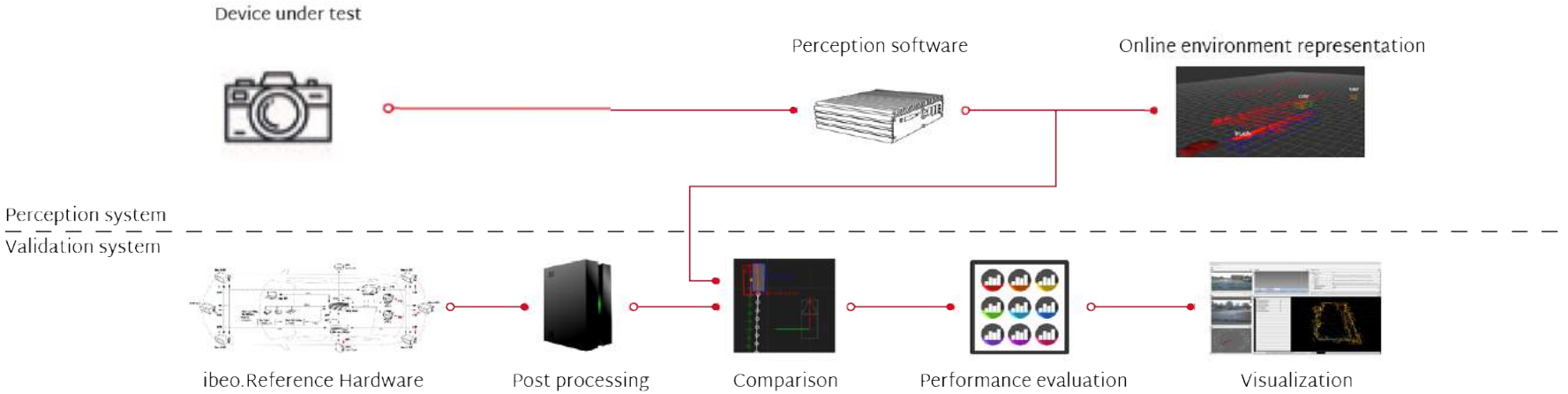
REFERENCE CHALLENGE: CUSTOMIZED VALIDATION SOLUTION FOR ANY USE CASE



REF technology requirements:
- Small, configurable sensor adjustable to use case
- Accurate recording of the complete environment
- High-resolution 4D point cloud including reflectivity information
- Customizable in range, resolution, field of view, and the overall number of sensors

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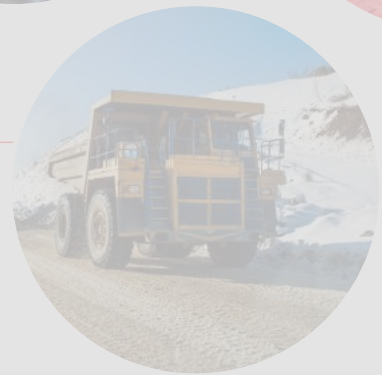

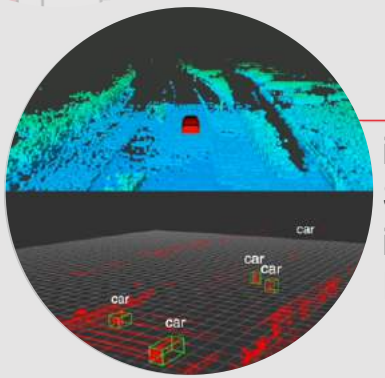

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OUR RESPONSE: IBEONEXT 4D SOLID STATE LIDAR

Together with a radar and camera, redundant detection that covers a 360° field of view.

4D with 0.1° resolution measurement capability.

The ability to detect cutting-in vehicles requires a high horizontal field of view with a 0.1° resolution.

Around 5 centimeters detection accuracy on fixed objects.

Detection and recognition of small objects of 15 centimeters at a 130m distance.

The ability to create highly accurate 4D representation of the environment.

IBEONEXT MARKS THE NEXT BIG MILESTONE ON THE WAY TO FULLY AUTONOMOUS DRIVING

Solid state – no moving parts.

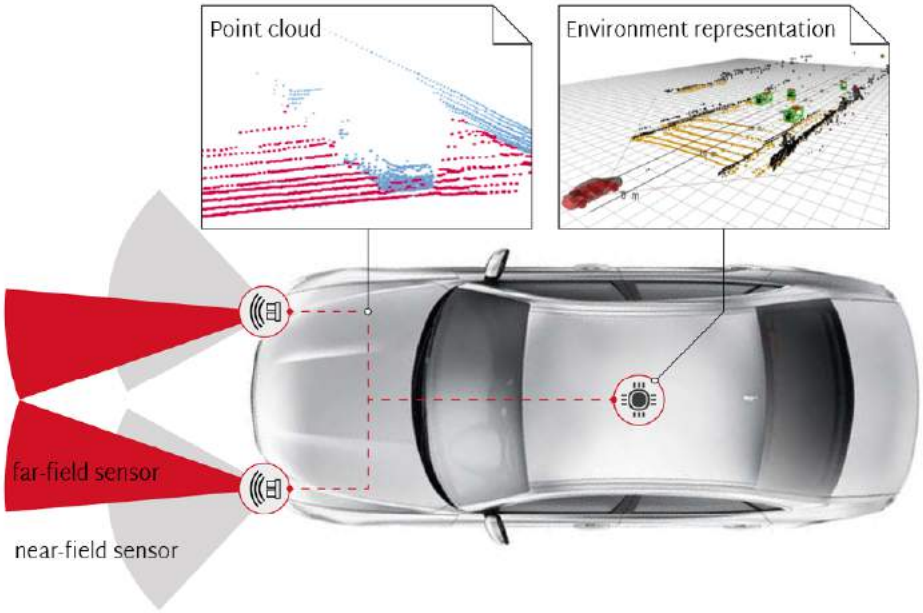
Modular concept: same electronics and different optics support a wide range of applications from ADAS up to AD L5.

Mechanical design can be adapted to customer needs to fulfill e.g. requirement concerning packaging.

Small size and weight.

4D output: 3D point cloud & intensity image.

Manufacturability at automotive standards.



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THANK YOU!

www.ibeo-as.com Ibeo Automotive Systems GmbH | Merkurring 60-62 | 22143 Hamburg, Germany